CLAIMS

What is claimed is:

1. An apparatus for rapid hybridization, comprising:

(a) a chamber having a buffer, a first molecule, and a second molecule;

(b) two electrodes, spaced on either side of said chamber, and in direct contact with said buffer; and

(c) a cyclical electric field generator to establish a cyclical electric field between said two electrodes to electrically move said first molecule across said buffer in a cyclical pattern to bind said first molecule with said second molecule .

2. The apparatus of claim 1, wherein said first molecule is a mobile molecule.

3. The apparatus of claim 1, wherein said second molecule is a mobile molecule or an immobile molecule.

4. The apparatus of claim 1, wherein said second molecule is part of a microarray.

5. The apparatus of claim 1, wherein said first molecule or said second molecule is a nucleic acid, a protein, a polymer, a peptide, an antibody, an antigen, or a tissue.

6. The apparatus of claim 1, wherein said electrodes have holes or provide a gap to vent generated gases.

7. The apparatus of claim 1, wherein said chamber further comprises a lid.

8. The apparatus of claim 1, wherein said cyclical electric field generator generates a cyclical voltage selected from a range of 1-680Volts.

9. The apparatus of claim 1, wherein said cyclical electric field generator generates a cyclical electric field selected from a range of 0.17-113Volts/cm.

10. The apparatus of claim 1, wherein said cyclical electric field generator generates a cyclical frequency selected from a range of 0.06-940 Hertz.

11. The apparatus of claim 1, wherein said cyclical electric field generator comprises of an adjustable frequency oscillator, an adjustable voltage power supply, a fixed voltage power supply, a high voltage amplifier, a solid state relay an optoisolator, an optocoupler, or a photocoupler.

12. The apparatus of claim 1, further comprising a temperature controlling means for controlling the temperature of said buffer.

13. The apparatus of claim 1, wherein said cyclical pattern is a square, a triangular, a sinusoidal or a step pattern.

14. A method of rapid hybridization of molecules comprising the steps of:

a. providing a chamber with a buffer, a first molecule and a second molecule;

b. providing two electrodes on either side of said chamber and in direct contact with said buffer; and

c. generating a cyclical electric field between said two electrodes to electrically move said first molecule across said buffer in a cyclical pattern to bind said first molecule with said second molecule.

15. The method of claim 14, wherein said cyclical electric field increases the binding of said first molecule to said second molecule.

16. The method of claim 14, wherein said cyclical electric field decreases the binding of said first molecule to said second molecule.

17. The method of claim 14, wherein said cyclical electric field injects said first molecule or said second molecule through a cell wall into a cell.

18. The method of claim 14, wherein said cyclical electric field has a cyclical voltage selected from a range of 1-680 Volts.

19. The method of claim 18, further comprising the step of changing said cyclical voltage to a different cyclical voltage from said cyclical voltage, wherein said different cyclical voltage is selected from a range of 1-680 Volts.

20. The method of claim 14, wherein said cyclical electric field is selected from a range of 0.17-113 Volts/cm.

21. The method of claim 20, further comprising the step of changing said cyclical electric field to a different cyclical electric field from said cyclical electric field, wherein said different cyclical electric field is selected from a range of 0.17-113 Volts/cm.

22. The method of claim 14, wherein said cyclical electric field has a cyclical frequency selected from a range of 0.06-940 Hertz.

23. The method of claim 22, further comprising the step of changing said cyclical frequency to a different cyclical frequency from said cyclical frequency, wherein said different cyclical frequency is selected from a range of 0.06-940 Hertz.

24. The method of claim 14, wherein said first molecule is a mobile molecule.

25. The method of claim 14, wherein said second molecule is a mobile or an immobile molecule.

26. The method of claim 14, wherein said cyclical electric field denatures said first or said second molecule.

27. The method of claim 14, wherein said first molecule or said second molecule is a nucleic acid, a protein, a polymer, a peptide, an antibody, an antigen, or a tissue.

28. The method of claim 14, wherein said second molecule is part of a microarray.

29. The method of claim 14, further comprising the step of controlling the temperature of said buffer.

30. A method of rapid hybridization of molecules comprising the steps of:

(a) providing a chamber having a buffer and two electrodes in direct contact with said buffer and positioned on either side of said chamber;

(b) forming a layer of immobile first molecules on a substrate and placing said layer of immobile first molecules in said chamber;

(c) adding a second mobile molecule in said buffer;

(d) establishing a cyclical electric field between said two electrodes and across said buffer;

(e) electrically moving said second molecule, across said buffer, in a cyclical pattern, binding said second mobile molecule with said layer of immobile first molecules on a substrate, and forming a layer of hybridized first and second molecules on a substrate;

(f) removing the said layer of hybridized first and second molecules on a substrate;

(g) denaturing the said layer of hybridized first and second molecules on a substrate and forming a denatured second molecule(s), and the said layer of immobile first molecules on a substrate;

(h) harvesting said denatured second molecules;

(i) placing the said layer of immobile molecules on a substrate back into said buffer with said second molecule; and

(j) repeating the steps "d" through "i".

31. A method of rapidly dissociating molecules comprising the steps of:

(a) providing a chamber having a buffer and two electrodes in direct contact with said buffer and positioned on either side of said chamber;

(b) forming in said chamber a layer of second molecules bound to a layer of immobile first molecules on a substrate, and placing said layer of second molecules bound to said layer of immobile first molecules on said substrate; and

(c) establishing a cyclical electric field between said two electrodes and across said buffer to electrically unbind said second molecule from said layer of second molecules bound to said layer of immobile first molecules on said substrate.